LIQUID-LIQUID EQUILIBRIUM IN QUARTERNARY SYSTEMS ETHANOL – ETHYLPROPANOATE – CHOLINE CHLORIDE – GLYCEROL, PROPANOL – PROPYLPROPANOATE – CHOLINE CHLORIDE –GLYCEROL, BUTANOL – BUTYLPROPANOATE – CHOLINE CHLORIDE – GLYCEROL

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Development of chemistry nowadays gives the certain direction to decrease environmental impact of different compounds. That is why “green chemistry” principles are commonly described during recent years. One of the most popular idea in this area is searching for organic solvents’ substitutions because of its inherent toxicity and high volatility, which are reason of air emission of volatile organic substances. Abbot and co-workers in 2003 supposed deep eutectic solvents (DES) as next step of ionic liquids (ILs) [1]. Ionic liquids are salts with organic cation (as usual, pyridinium, imidazolium or phosphonium) and different anions. ILs’ low vapor pressure made possible using it instead of some organic solvents [2]. On the other hand, ILs cannot be summarized as non-toxic group of solvents, and DESs can be an appropriate alternative. DES is a eutectic mixture based on two components which have high melting point, where hydrogen-bonding interactions were observed. Investigators found different combinations of hydrogen-bond donors (HBDs) and acceptors (HBAs). Choline chloride-based mixtures in the form of HBAs with various HBDs are the most widely studied [3].

Herein DESs based on choline chloride in combination with glycerol were taken for separation azeotropic mixtures of three alcohols (ethanol, propanol, butanol) and corresponding propanoate systems. Tie-lines were obtained at temperatures 293.15 K and 313.15 K and atmospheric pressure. The compositions of coexisting organic and DES phases are determined by NMR-spectroscopy. The extraction performance was characterized with distribution coefficients and values of selectivity for used alcohols.

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1. Abbott, A. P., Capper, G. et al., Chem. Commun. 70–71, (2003).
2. Tarasova N., Smetannikov I., Zanin A., Usp. Khimii, 76, 516-531 (2010).
3. Francisco, M., Van Den Bruinhorst, A., Kroon, M. C., Angew. Chem., Int. Ed., 52, 3074−3085 (2013).